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THE CALIFORNIA

SILK GROWERS' MANUAL.

By W. B. EWER, A. M.

PUBLISHED UNDER DIRECTION OF THE

CALIFORNIA SILK CULTURE ASSOCIATION.

BY

DEWEY & CO.,

Office of the "Pacific Rural Press,"

SAN FRANCISCO.

1882.

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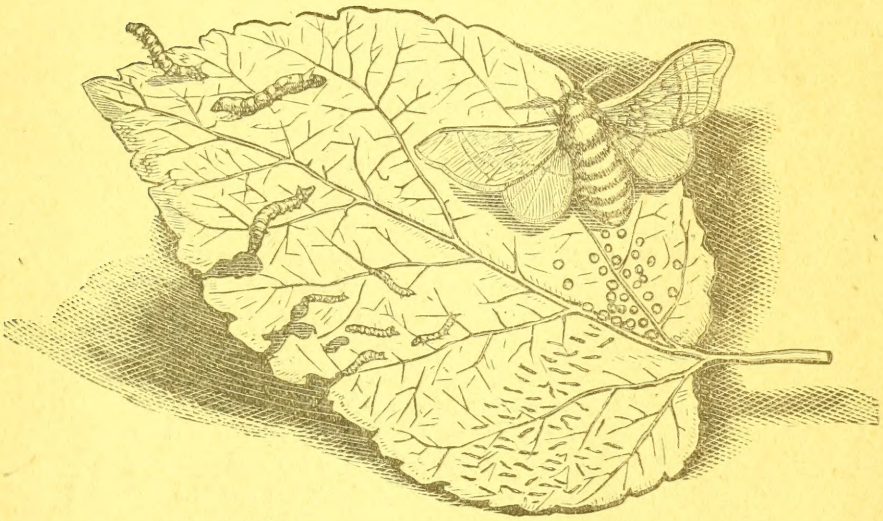

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PREFATORY NOTE.

This manual has been prepared at the request of the California "Silk Culture Association," and is published for the purpose of encouraging Home Silk Culture in California. It is believed that any person, by aid of the instruction given in these pages, will be able, without any further assistance, to plant and cultivate the mulberry tree, hatch and feed the worms, and prepare the cocoons for reeling or a market.

The proof is abundant that California can produce the very finest silk; for it has already been done. The superiority of our climate and soil for that business is acknowledged by every silk expert from Europe who has visited California.

The California Silk Culture Association has been untiring in its efforts during the past two years to establish this great industry upon a permanent basis, by collecting and disseminating information on the subject, well knowing that former attempts have failed mainly through an insufficient knowledge on the part of those who engaged in the work. With proper knowledge and a reasonable degree of industry and care there need be no failure; and the failures of the past afford no good room for discouragement.

All who wish well to the future interests of the State should encourage and assist in this good work. With proper efforts it is believed that the silk industry might be made one of the leading industries of the State, and a great boon and rich blessing to all our people.

The author acknowledges his indebtedness in the preparation of these pages both to Mrs. T. H. Hittell, personally, and to the "Silk Growers' Instructor," prepared by her, and published in 1881. He has ventured upon the work himself only because Mrs. Hittell, in her present feeble state of health, has not been able to revise her own work. He is also indebted to the assistance of many others, who have had more or less experience in the business, here and elsewhere, and who have been consulted either personally or by letter. That the good work, so happily initiated by the ladies of this Association, may be carried on to a termination useful and profitable to the State, is the sincere wish of

THE AUTHOR.

INTRODUCTION.

Silk culture, which has done so much for Europe, has now become an established industry in several of the States of the American Union; but in no State are the conditions more favorable for its future growth than in California. Its success here is certain.

In Europe the production of raw silk gives profitable employment to millions of people, while the subsequent manufacture of the raw material into thread, ribbons, dress goods, etc., forms one of the most important of home industries. The most prosperous nations there have wisely fostered this industry by national aid and by royal example. In France the raising of the silk worm, the forming and care of the cocoon, and the reeling of the silk is made an important part of the education of the children in nearly all the schools, convents and academies. Educators in the United States will also do well to turn their attention to this subject, and, especially here in California, it might be *so* applied as to furnish a practical solution of the perplexing question: "What shall we do with our girls and boys?" Silk culture is peculiarly adapted for the employment of children and women; and in no State in the Union are we so much troubled to find employment for that portion of our population as here. We have a large and rapidly increasing proportion of juveniles, and fully nine out of ten, both in city and country, need and desire to find some honorable employment during their minority. The necessity for meeting this demand is already imperative, and our present inability to do so is one of the most embarrassing problems which we now have to face.

To meet this emergency there appears to be no better plan than the one proposed by the California Silk Culture Association—the general introduction of silk culture here in all its branches; and it is a matter of no small congratulation that so many of the able, earnest and philanthropic ladies of San Francisco have stepped to the front to inaugurate this work. The success of this Association has already been great. Quite too much has been done to be even briefly reviewed here. We have no speculative purpose in our work. Our work is purely a labor of love. Its purpose is to encourage silk culture among the farmers and residents of our towns and cities until it shall become one of the chief industries of California, rivaling in its golden results even the gathering of the precious treasure from our hillsides, our rivers and our placers. The Governor of the State stands at the head of our Advisory Board, and our ranks are made up from all classes of the people. The wise, the wealthy, the patriotic, the influential, the earnest, and the hard-working men and women of city and country have joined hands in this endeavor to open up a new industry, which will add to our commercial prosperity as a State, increase the individual wealth of

the masses, and greatly multiply the manifold blessings which local industries ever carry to the homes of a people.

Amid the mass of correspondence which our endeavors have elicited, asking for information in regard to the ways and means for establishing cocooneries, and the probabilities of success in efforts at silk culture in this State, perhaps none has been more important than a letter recently received from the California Emigrant Aid Society, which was referred to a special committee for answer. Your committee, having carefully considered the information sought, begs leave to report as follows:

ADAPTABILITY OF CALIFORNIA FOR SILK CULTURE.

Sufficient has already been done in California, by a few individuals, to prove that this State possesses peculiar advantages for success in all branches of the silk business, from the rearing of the worms to the manufacture of silk in every form in which it comes from the reel or the loom.

As early as 1861, the late Mr. Prevost, of San Jose, commenced raising the silk worm and producing cocoons, some of which were sent to Lyons and Paris. From both cities certificates were received pronouncing them of superior quality, both for reeling and in the character of the raw silk which they yielded. California cocoons were sent to the Centennial exposition at Philadelphia, in 1876, which, for size and beauty, attracted universal attention. Mrs. Keeney, of San Rafael, who has been experimenting in this direction for many years, sent some cocoons to the Smithsonian Institute, which were pronounced, by Prof. Henry, superior to any specimens which had been sent there from other countries, numerous lots of which had been received as samples.

Not only cocoons, but eggs also have been successfully sent to Europe. As early as 1865 or 1866, Mr. Prevost sent silkworm eggs of his raising to France, which were pronounced, by good judges, superior to those which silk growers there were then just beginning to receive from Japan, and for several years he had orders for more than ten times the amount he could supply. At one time he received an order for one hundred pounds, when he had only a few ounces to spare. In 1878 or 1879, Mr. J. A. Garbarina, of Jackson, Amador county, sent one hundred ounces of eggs raised by him to different places in Italy. As an evidence that they arrived in good condition and were healthy, he received orders begging him to save all the eggs he could raise and forward them the next season. These facts are quite sufficient to prove that we have in this a most lucrative business, upon which this State might enter with but little more capital than is found in the active brain and willing muscle of our farmers' wives and daughters. Let them now commence experimenting on a small scale, under the patronage and instructions of this Society, and within three years they will be able to realize a handsome profit from the costless venture.

Right here we may remark that it should be more generally known among our people that, for some reason not yet known, healthy eggs cannot be raised in Europe. Hence, for the past ten or fifteen years, silk growers there have depended on Japan for their annual supply of that product—the Japanese eggs being shipped to Europe *via* San Francisco and the Pacific railroad. California ought and might easily secure this business, which is already worth several millions per annum, and constantly increasing in importance. The business is, moreover, a very profitable one.

This Society has also recently received several certificates from Drs. Behr and Harkness, of this city, certifying to the unexceptional character of several lots of eggs of last season's California production. They were subjected to a careful microscopical examination, and were pronounced perfectly free from any trace of disease or any evidence of having been attacked by any disease, from which it would appear that California is not retrograding in the character of this product.

Mrs. Sellers, who resides near Antioch, in Contra Costa county, has been successfully raising silkworms for several years. She

has now a mulberry grove of three thousand trees, which are remarkably healthy, and every season loaded with leaves and berries. Several other persons, among whom may be mentioned Mr. Gillet and Prof. Muller, of Nevada City; Mr. Larca, of San Mateo; Mr. Prince, near Angel's Camp; Mr. Garbarino, of Calaveras, and others are meeting with equal success.

SOIL AND CLIMATE.

The above facts and experiments prove that this business may be successfully prosecuted, not only throughout the great valleys of this State, but well up into the foothills and quite near the coast as well. The mulberry will grow almost anywhere in California; but, to meet with the best success, a rich, light, loamy soil is required. The ground should be plowed deep and well pulverized, so as to allow the rootlets to freely permeate the soil. If on a side-hill, a southern exposure should be selected. Among the most important advantages met with here is our freedom from thunder and lightning, and from rains during the feeding season; as feeding with wet leaves is almost sure death to the worms, and the jar from thunder, or some peculiar electric disturbance attending thunder storms, is often attended with fatal consequences to them, especially if it occur during the molting season.

VARIETIES OF THE MULBERRY TREE.

There are many varieties of the mulberry, but only four are considered especially suitable for silk culture—the *Morus alba* the *Morus rose*, the *Morus japonica* and the *Morus multicaulis*. Of these, the first named is considered the best. The latter is the most productive in foliage, and is, perhaps, preferable in the early stages of the leaf for feeding during the first age of the worm. But a more healthy maturity and better silk is obtained by feeding the *Alba*, after the first age.

PROPAGATING AND CULTIVATING THE TREE.

The mulberry may be propagated either from seed or from cuttings, like the grapevine. The latter is preferable. The cuttings should be from ten to twelve inches in length. Place them in the ground in rows. One end of the cutting should be set three or four inches deeper than the other. The upper end, which should also be the topmost end of the cutting itself, should be barely covered with soil. If it is left out of the ground, or exposed to the atmosphere, the hot sun and dry air of this climate is liable to dry it up, and thus prevent it from taking root. The rows should be set five or six feet apart.

A sufficient quantity of leaves can be obtained from a dozen cuttings, one year old, for feeding a few worms by way of experiment. In trimming, the custom in Europe is, for the first few days' feeding, to strip the tender leaves from the branches, and, in the later feeding, to cut the smaller shoots from the main branches and feed the leaves as they are thus attached. A considerable portion of the larger branches are suffered to remain, being simply stripped of their leaves and smaller branchlets during the season for feeding the worms. After the worms have commenced spinning, new leaves will form, and the mulberry orchard will soon be clothed a second time with a dense mass of foliage. When this crop of leaves has arrived at maturity a thorough process of pruning is commenced, by cutting off all the new wood within two or three inches of the main stem or stump. These branches are cut as wanted, and fed to cattle, which eat the leaves and small twigs most voraciously; and this is considered equal to the best fodder obtainable, especially for cows. It will be seen from the above that the foliage of the trees is kept constantly within easy reach, and that they are managed and grow much like the grapevine, with the only difference that the limbs of the mulberry grow more erect, branching off and upward from the main stem, instead of trailing like the vine. The product of this last trimming may, if desirable, be laid aside and separated into cuttings for further propagation. In stripping leaves from branches, the hand should always be moved upward along the limb, from the main trunk or branch to the tip. Otherwise the dormant buds would be injured.

FOR MERE EXPERIMENTAL PURPOSES

Only a few hundred worms are needed, and but little preparation will be required after arrangements have been made to secure a supply of leaves. A part of a small room, with one or two tables or some short boards properly placed, is all that will be needed.

The worms can be handled and separated or moved from place to place, to thin them out as they increase in size, or to clean the tables, by merely raising them up on the branches which may be placed before them for feeding. All this will be more fully explained when we come to speak of the cocoonery proper.

THE FEEDING ROOM, OR COCOONERY.

For a more extensive feeding—say from one hundred to one hundred and twenty thousand worms—a regular cocoonery should be fitted up, something as follows: A room 20x16 feet in area will be needed, and ten or eleven feet high. Such a room, if not new, should be carefully cleaned and whitewashed, and so guarded that neither insects or mice can invade it. Great cleanliness should always be observed about a cocoonery. All foul odors should be avoided. The fumes from tobacco should not be allowed on the premises. The room should have windows on opposite sides to secure good ventilation. In an especially hot climate it should be carefully shaded by trees or canvas. The entrance should be from the north. Windows and doors should be protected from the invasion of mosquitoes, yellow jackets, spiders, bats, etc., with nets. If a special building is constructed for a cocoonery, it would be well to let it rest upon posts several inches from the ground, and a circle of tar should be put upon the posts to intercept the approach of insects, as is sometimes done with trees, for a similar purpose. If a room in the house is used, posts which support the shelves should rest in basins of water, to protect the worms from ants. Care must also be taken to keep mice and birds away.

FITTING UP THE COCOONERY.

The worms should be fed upon shelves, which may extend entirely around the room, leaving a space for an entrance only. To economize room, the central space may also be fitted up with shelves. The wall shelves should be about three feet deep, with a space of about two and a half feet between them. The center shelves may be four feet or more in depth, as the worms upon them may be attended to from either side. This arrangement will give a series of four shelves in hight, and leave an alley-way three feet in width all around the room between the wall and center shelves. The upper shelves will have to be reached by the aid of a stool to stand upon; but they will be needed only during the last age of the worms.

For experimental purposes a few shallow pasteboard or wooden boxes of suitable size, laid upon tables, will be very convenient for feeding. If tables are used, they should have a small strip of wood fastened to the edge to keep the worms from falling off. The same precautions should be used on the shelves in the cocoonery.

HATCHING THE EGGS.

The eggs should be brought out for hatching as soon as the mulberry leaves have attained sufficient size for feeding, and while they are yet juicy and tender. They should be brought out in the evening from the cool place where they have been stored and immersed in cold water over night. In the morning they may be easily scraped with a dull case knife from the cloth upon which they have been laid, and to which they have been attached by the mother miller. Care should be taken in thus removing not to injure them. After being removed from the cloth they may be again placed in water, when the good eggs will sink to the bottom, while the poor ones and the dissolved gum may be poured off. The eggs should then be drained and dried, spread thinly upon convenient sheets of clean white paper and placed in a warm room to hatch. It is better that the temperature of the room into which they are introduced for hatching should be graduated, so that the change from cold to warm may not be too sudden. The eggs will hatch out in a temperature of seventy-eight to eighty degrees in from three to four days. When the worms begin to appear, spread over them

a coarse mosquito netting, to be hereafter described. The worms will soon leave the paper on which they have been hatched and crawl through the meshes in the netting to the surface of the same in search of food. When the morning's hatch has crawled through, the mosquito frame should be removed to the feeding place. Each day's hatch should be marked, kept and fed by itself. This is especially important where the feeding is on a large scale. The importance of this will become apparent when the reader is informed in regard to the molting of the worms, which will be described further on. In hatching only a portion of the eggs should be exposed at first, as thus, in case of accident, the supply would not be entirely lost. This caution should be especially heeded by beginners. It should be borne in mind that the eggs which hatch the soonest produce the most healthy worms. The cocoons from these should always be selected for producing eggs again. Such worms also produce the best and heaviest cocoons. Worms which come out after the fourth day are scarcely worth feeding.

FEEDING THE WORMS.

The larger portion of the worms come out between five and seven o'clock in the morning. A few very tender leaves should be scattered upon the netting placed to receive them, not immediately, but very soon after they appear, else they will wander away. They will never leave if food is placed near them. As already intimated, young and tender leaves only should be fed to the young worms, and the more mature leaves to the older ones, as the latter contain a larger proportion of the solid and nutritious food which is needed for forming the silk-producing material, which is gradually stored up in the body of the worm until the time arrives for spinning the cocoon. The first leaves fed should be carefully cut up into small pieces about the size of a ten-cent piece—they may be cut in bunches with a sharp knife. This is, in part, to enable the tiny worms to better get hold of their food, and also to enable the feeder to scatter the food more evenly among the worms.

Special care should be taken not to feed the worms upon the red-colored leaves taken from the very young shoots, as the nutriment in such leaves is not sufficiently matured, and, if eaten, will often cause the worms to sicken and sometimes die.

The feeding for the first five days should be very frequent—as often as every two hours the first and second day. The intervals between feeding may then be gradually lengthened to three and four hours. In all cases, however, judgment should be used. The worms should at all times have a plenty of food before them, and it should not be allowed to get too dry. The worms are not usually fed between ten at night and broad daylight in the morning.

It may be remarked, in this connection that the time of feeding occupies from twenty-five to thirty-five days. This variation is due to the care which the worms receive, and particularly to the temperature at which they have been kept.

If they are well cared for, and kept in a warm, healthy condition and fed often, they will eat all the more within a given time, and arrive so much the quicker to the season for spinning their cocoons. The period for spinning does not depend so much upon the age of the worm as upon the amount of food which it has eaten, and that in turn depends upon its appetite, and that, again, upon its health. It is claimed by most silk culturists that the quicker the worm is brought to maturity the better the silk, the larger the cocoon, and the longer the thread. In order to reach this end, some give one or two feedings during the night. Very healthy and active worms will feed at night—requiring but little or no rest. Sickly or feeble worms require a short interval of rest at night. It is simply in accordance with common sense, that the more healthy the worm the better will be the quality and greater the quantity of silk produced, and *vice versa*.

CONVENIENCES FOR FEEDING THE WORMS.

As already intimated, for merely experimental purposes, but little preparation is needed; but, when it is proposed to fit up a cocoonery where a large amount of labor is

involved, it will be found a matter of economy to have a proper series of feeding frames provided, which may be made substantially as follows: Nail together four strips of wood so as to form a frame, of convenient size for handling. Take four of these frames and bore holes in each of the sides, so that the holes in the first shall be one-fifth of an inch apart; in the second, one-third; in the third, two-thirds, and in the fourth, one inch apart. Take stout cotton cord and put it through these holes, and you will have a series of network frames, with four different-sized meshes with which to work. In making the frame some prefer split cane, such as is used for chairs, or fine basket willow instead of cord. If twine is used it should be very coarse.

Common laths firmly nailed together, with tacks driven into the upper surface, at the same intervals as given in the directions for boring the holes, so as to allow the cord to be passed across the frame and held in place by the tacks, is a simpler and perhaps, equally as good a way in which to construct the feeding frames. The mosquito netting, already alluded to, should also be put in frames. After the worms have become too large to get through the mosquito netting, use the frame with smallest meshes, and so on to the largest.

CLEANING OFF THE SHELVES.

Before placing the worms upon the shelves for feeding, each shelf should be covered with paper—common newspapers will answer. By this arrangement when the frames on which the worms are feeding are lifted up the paper may be drawn out by an assistant, with all the litter, which may be readily shaken off and the paper replaced upon the shelf. By this means the worms will not be seriously disturbed, while the shelves may be kept clean and sweet. The shelves should be cleaned off twice between each molting. This is very essential.

Some prefer to dispense altogether with the frames. In this process, when the worms are first placed on the netting or paper to feed, a few tender leaves are scattered about for the first two days' feeding. After that the leaves, without being stripped from the branches, are carefully placed over the worms. They may be longer and heavier as the worms increase in size. The worms will immediately leave the old and crawl up to the new leaves. The branches should be laid on, carefully crossing each other, so as not to pack. When it is desirable to clean off the litter, the branches on which worms are feeding should be carefully lifted up, while an assistant removes the litter as directed in the use of the frames.

THINNING OUT.

As the worms increase in age and size they will gradually require more and more space for feeding. This will be readily inferred when the reader reflects that the feeding process continues about thirty days, and that at the end of the fourth day the worm is only one-quarter of an inch long, while at the thirtieth, or when it is ready to spin its cocoon, it is fully four and a half inches long, and proportionally large of body.

The worms will require increased space the second day, and so on. To secure this, when a new frame with fresh leaves has been placed over the worms, as soon as, say, half the worms have come through, remove that frame to a new place and immediately place another frame, with fresh leaves, to receive the balance of the worms as they come up. If necessary, three frames may thus be used in succession.

CAREFUL FEEDING AND CLEANLINESS IMPORTANT.

It has already been observed that the length and perfection of the thread of the cocoon depends largely on the care in feeding and the cleanliness observed. The frequency of feeding should be made largely a matter of judgment and experience. Care should be taken in placing the frames that they do not press down so as to confine the worms, or keep from them a free circulation of air. The frames should lay up lightly while the worms are transferring themselves from an under to an upper one. It would be well to have four or eight legs attached to each frame. Wooden pegs or long nails driven into the under side answer the purpose very well. When fed on branches the

worms very quickly mount the twigs to feed and enjoy fresh air. If there should be any considerable number of ill-fed ones, or those who from any cause lag behind, the cocoons produced by them will be imperfect, and the entire lot will be reduced by the buyer to the grade of the imperfect ones.

Especial care should be observed during the last three ages, or from the tenth to the thirtieth day of feeding. The consumption of food at that time is enormous, as will be seen under the head of "Facts and Figures," given at the close of this discussion. The worms usually consume about their own weight in leaves daily, except when molting.

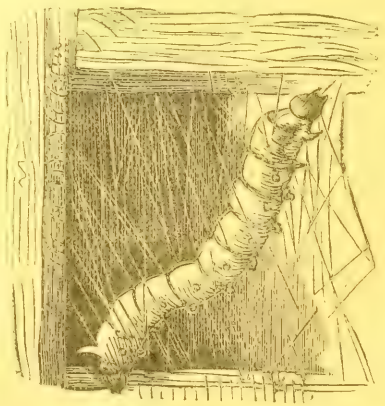
THE MOLTING SEASON.

The silkworm's life is divided into five ages; at the close of the first, second, third and fourth ages it molts, or casts its skin. At the the close of the fifth age it forms its cocoon.

The first molting season comes on the fourth or fifth day after hatching. The worms at that time cease to eat, generally retire under a leaf or some litter, attach their hind legs to a branch or leaf by means of a gummy matter which they exude, and apparently fall to sleep. This is called their molting sleep, and during its continuance they must not be disturbed. At this time, and at each successive molting, also when the worms are ready to spin the cocoon great care should be taken to prevent any cold draft of air from striking the worms. It is at this time especially that thunder is apt to injure them. One great advantage which California possesses in the rearing of the silkworm is the absence of electrical discharges, which cannot be avoided in other silk-growing regions. The worm should never be disturbed in any way, not even by cleaning or feeding during the molting season. After each period of molting the worms feed with increased greediness.

The approach of the molting sleep may always be known from the fact that some of the worms begin to cease feeding and raise their heads, swinging them to and fro with a waving, uneasy motion. When this is noticed, fresh leaves should be immediately placed before the tardy ones to hurry them up, in order that the entire hatching may cast their skins as near together as possible.

This will explain the necessity alluded to previously of always keeping each day's hatching by itself. No food should be given to any of the hatch until all are about through their season, in order that they may have an even start on the next age. After each molting the space required for feeding will generally need to be largely increased, as will be noticed elsewhere. If the young worms appear feeble or with little appetite, feed them for a while with very tender leaves, as when first hatched. If the worms are troubled in molting it is generally because improper food has been given them, or because the temperature of the cocoonery has not been properly attended to. When the feeder has the time to spare he may often save many worms during the two last stages by assisting them, as experience will teach. More or less worms always die in molting. All who die at any time should be carefully picked off and thrown out of the room.



Worm Commencing to Form its Cocoon.

The temperature of the cocoonery should always be maintained, as evenly as possible, at from seventy-eight to eighty-two degrees, F. If it falls below seventy-five degrees it must be raised by artificial means. If it exceed eighty-four or eighty-five degrees it should be reduced by increased ventilation, by

sprinkling water on the floor, on the outside of the building, or upon the ground around the cocoonery. No cocoonery can be successfully managed without a reliable thermometer.

Living worms should never be handled with the fingers; when necessary to handle them always use a small twig or straw, upon which they will quickly crawl.

FORMING THE COCOON.

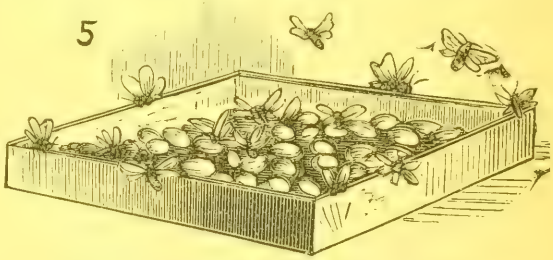
When ready to spin, or form the cocoon, which is the eighth or ninth day after its fourth molt, the worms cease to eat, become restless, empty themselves more freely, become more transparent, and slightly diminish in size. They also begin to give out their silk. When these indications are noticed, conveniences must be furnished for the process, and, if placed convenient, the worms will very soon find them. Various devices may be used for this purpose, which the ingenuity and skill of the intelligent feeder, with a little experience, will readily discover. If feeding frames, as before described, have been employed, two of these frames, with spaces between sufficient to accommodate the worms, may be set up endways near the feeding space. The worms will soon find them, climb up between them, and there form their cocoons. Small bunches of straw eighteen inches or two feet long may be tied together near one end and the other spread loosely apart. The worms will find their way into the open heads of the bunches and there spin. Bundles of small twigs may be used in the same way. It may be mentioned here that all boards and other wood work used about a cocoonery should be thoroughly seasoned and free from dampness, pitch or any unpleasant smell.

The cocoon is usually formed in about four days, and three more are required for the worm to pass into its chrysalis state. But the cocoon must not be removed from its place short of eight days for reeling or killing; while, if required for eggs, it must remain for ten or twelve days after the worm has gone up to spin. Care should also be taken that no two worms should form their cocoons too near each other, else they might become interwoven, which would render it impossible to reel them.

The loose floss silk by which the twigs, straw, etc., may be covered, and which also loosely envelops the cocoon, is no part of the cocoon proper. Within this structure, and easily separated from it, is the real silk cocoon, which consists of a continuous thread, generally about twelve hundred feet long.

TREATMENT OF COCOONS FOR EGGS.

At the proper time, as given above, after the cocoons have been completed, if wanted for eggs, they must be separated from the material to which they are attached, and stowed away in shallow boxes in a cool place, of even temperature, where the chrysalis may be allowed to change into the moth. That process will occupy from fifteen to twenty days—according to the temperature—from the time the worms began to spin. The very best cocoons should be carefully selected for eggs—those, generally, which are of light color and firm consistency—feeling hard to the touch. Before being packed away they should be carefully stripped of all the light floss with which they are loosely enveloped.



Moths Emerging From Their Cocoons.

Care should also be taken to select an equal number of each sex. A male cocoon may be readily known by its being slightly constricted about the central region, something like a peanut. Its extremities are also more pointed than those of the female. The female cocoon is somewhat egg-shaped and quite symmetrical in form, without any constriction whatever about the center.

As the time for the appearance of the miller approaches, the selected cocoons should be brought out and placed on tables or shelves in a somewhat darkened room, warm but well ventilated, where they should be carefully watched until the millers begin to appear. Although they have wings, neither sex flies; but the male is more active than the female, and is readily known by its smaller size and continual flutter of wings. The female moves but little either body or wings.

FECUNDATION.

The moths generally come out of the cocoon in the morning, between seven and eight o'clock. They should be immediately paired or the eggs will not be good. As fast as they become paired they should be removed by taking them up carefully by their wings, and placing them upon white paper upon tables or boards, where they

Female Moth—Natural Size.

should be left in quiet and darkness, as the silk moth is a night insect. In thus removing them care should be taken not to hurt or separate them. Such as are not paired should be placed on a separate sheet of paper, when they will soon become mated, after which they should be placed with the others already paired. Occasionally a male among the paired ones gets separated from his companion. When this happens he should be removed, else he will cause disturbance and further separations. All those that become separated are to be put back with the unpaired ones, that they may get mated again. The unmated males placed in the box are kept for reserve. All the balance may be thrown out. The next morning the process is repeated the same as before with the remaining moths. This process is to be kept up from day to day till all the moths have emerged from the cocoons. After all are paired, they should be allowed to remain undisturbed about twenty-four hours, when they are to be separated, by taking the wings of the male with one hand and those of the female with the other, and drawing them apart gently, so as not to hurt them. After this the males may be cast aside and the females placed on pieces of white cotton cloth, about twelve by fifteen inches in area, where they are to lay their eggs.

LAYING THE EGGS.

The females generally begin to lay as soon as the separation from the males is effected. It is important that the two sexes be completely separated. When once the females have commenced laying they need to be looked after no further. They lay from two hundred to three hundred and fifty eggs in number. This done, the mission of this wondrous insect is ended. As in the moth state it does not eat, it soon dies.

PRESERVING THE EGGS.

The cloths on which the eggs have been deposited should be hung up and allowed to so remain for fifteen or twenty days, as there is always a greater or less number of bivoltines in every lot of eggs. During this time the bivoltines will hatch out and the worms, not being fed, will perish, leaving only the annuals for the next spring's hatching season. After the bivoltines have thus hatched out the cloths, with the remaining eggs, may be taken down, rolled together carefully and placed in tin boxes, with a somewhat loose lid, two or more sides of which should be well perforated so as not to stifle the eggs as they will spoil if kept in air-tight vessels. These boxes should be kept in a cool room, or in a dry cellar facing north. They should be examined occasionally and aired, to see that they do not become mildewed from dampness.

WEIGHING THE EGGS.

To ascertain the weight of the eggs is very important, especially if they are intended for sale. The muslin on which the moth is to deposit the eggs must be carefully prepared. Each piece must be dried and then accurately weighed by itself, and its weight

in Troy grains (apothecaries' weight) must be marked upon it. Thus prepared it should be placed, at the proper time, under the moth to receive her eggs. Then, when the eggs are laid, each piece should be carefully weighed, and its weight distinctly marked as before, leaving both weights for inspection by the purchaser. The difference between the two weights shows the weight of the eggs.

PREPARING THE COCOONS FOR REELING.

In order to prepare the cocoons for reeling or for sale the chrysalis must be killed. This is commonly done by steam heat. In California it may be accomplished by exposing the cocoons to a hot sun from nine to four o'clock for two or three days. A longer time is needed if there is much air stirring. The examination of a few cocoons will determine when the work has been properly done. This process should be attended to within a week after the spinning is completed. It should be remarked that the heat of an oven destroys the fine gloss of the silk. Sun heat also fades somewhat injures the the gloss of the cocoon.

If it is desirable to retain the natural color of the cocoon the sun process should not be employed to kill the chrysalis, as the color will thereby be faded out to some extent. The chrysalis may be readily killed by placing the cocoons in any close vessel or box, into which steam may be conducted from a tea-kettle or boiler. A common wash-boiler might be used by putting a little water in the bottom and keeping the cocoons a few inches above the water, being careful to have the cover closed and kept tight, but not so much so as to admit of any explosion.

PREPARING THE COCOONS FOR MARKET.

In preparing the cocoons for market, after the chrysalis has been killed, the cocoons should be spread out on boards or shelves in a well ventilated room to dry. They should be frequently stirred or turned over for the first three or four days, and afterward occasionally for about two months; when they will have become thoroughly dried, the reeling process may be commenced, or they may be packed for shipment or a market. They may be packed either in barrels or boxes. In order to guard against insects a little pulverized camphor gum or other insectifuge should be sprinkled over each layer of three or four inches in depth. Tobacco stems would probably answer just as well if freely used, and would be much cheaper, as they can be had at the cigar factories for carrying away. Care should also be taken to guard the cocoons against moths, mice, or ants.

SPACE REQUIRED FOR WORMS.

The worms from one ounce of eggs—about thirty-six thousand—should have a space on the shelves:

In the 1st age of	10 sq. ft.
In the 2d age of	20 sq. ft.
In the 3d age of	50 sq. ft.
In the 4th age of	125 sq. ft.
In the 5th age of	225 sq. ft.

A room eight by twelve feet, with three tiers of shelves on three sides, will furnish sufficient room for feeding. The worms ought not to touch each other at any time.

VARIETIES OF SILKWORMS.

Domestication has had much to do in the production of varieties of the silkworm. The same worm transferred to another climate changes its character and silk product for the better or worse, according to the favorable or unfavorable conditions of its new home.

Some varieties produce one brood a year, no matter how the eggs are managed. Such are known as Annuals. There is another variety known as Bivoltines, which produce two broods a year—the first, as with annuals, in April or May; the second product may be obtained from the first litter of eggs within eight or ten days after they are laid. The eggs of annuals will not hatch, no matter how carefully treated, until the next season.

There are also Trivoltines, which will produce three generations in a year; Quadrivoltines, with four generations, and a variety known as "Dacey," which, if properly treated, may be made to produce eight generations in the course of a single year. Some varieties also molt but three instead of four

times a year. This is the case with Trivoltines in warm climates.

THE ANNUALS BEST.

Taking into consideration the size of the cocoon, the length of thread, the quality of the silk produced, the time occupied, the hardiness of the worm, etc., the annuals are almost universally considered the most profitable to raise.

The established varieties of the annuals are generally known by the color of the cocoons which they produce and the country in which they are most especially cultivated. The three best known and most marked European varieties are known as follows:

The Milanin (Italian), which produce a fine yellow cocoon.

The Ardeche—pronounced Ardesha—which produce a large yellow cocoon.

The Brouse (Turkish), which produce a white cocoon—generally considered to be the very best in quality.

The latter variety of silk is the most valuable in commerce; but the races which produce the colored cocoons are generally considered the most healthy.

THE SILKWORM IN CALIFORNIA—JAPANESE CUNNING.

The worm now domesticated in this State is of the latter class, and is probably a descendant of the Ardeche, the French variety, which was imported to this State about 1860 by Mr. Prevost, of San Jose. Mr. Prevost sent, in two successive years, to Japan for some eggs with which to commence his experiments in San Jose. Both these importations failed utterly. He never got a single worm from them. With a persistency characteristic of the man, and still resolved to prove the theory which he had promulgated—that California was pre-eminently calculated for silk culture—he sent out his orders again, and this time both to Japan and to France. The eggs arrived in due time, but those from Japan again failed, while his French eggs nearly all hatched out. The Japanese had shrewdly guessed his object, and adopted the plan of sending unfertilized eggs as a means of discouraging the attempt which they saw was being made in California to wrest from them the profitable business of supplying Europe with silkworm eggs. The lamented death of Mr. Prevost, a few years later, put a check for the time upon silk culture, which, had he lived, he would in all probability have fairly established in this State as soon as the speculative form to which his legitimate efforts gave a foothold had subsided.

This Society has now taken up the work of Mr. Prevost, and, if the spirit of speculation can be kept out of the way, it will no doubt soon succeed in accomplishing the end which he so persistently and so patriotically sought to attain.

From a paragraph on page 23 of Mrs. Hittell's "California Silk Growers' Instructor," it appears that Mr. H. Herich, of San Francisco, met with about the same experience as that related by Mr. Prevost, in getting silkworm eggs from China, and at about the same period of time.

FACTS AND FIGURES.

A few facts and figures are subjoined, from which almost any question that will be likely to come up in regard to silk culture may be answered, when the answer cannot be found in the foregoing pages.

The moths eat nothing after leaving the cocoons, and die in a few days after depositing their eggs. The females lay, on an average, about two hundred and sixty eggs. As an ounce of eggs numbers from thirty-six thousand to forty thousand, it will require about one hundred and fifty female moths to produce them. It should be remembered, however, that, in hatching, many of the eggs will fail; so that thirty-five thousand worms may be considered a fair result for an ounce of eggs; and that number of worms will produce about one hundred pounds of fresh cocoons, averaging about three hundred and fifty to the pound. These, when dried, will be reduced to about one-third of the original weight, or thirty-three pounds.

There is a very great difference in the weight as well as the quality of cocoons. Reports of careful observations made in the Atlantic States give the number of fresh cocoons to the pound all the way from two

hundred to four hundred and fifty and even five hundred. Female cocoons weigh about twenty-five per cent. more than male cocoons. The sexes are about equal in number.

It requires about thirteen pounds of fresh, or four and one-third pounds of dry cocoons to yield one pound of raw silk. It costs the labor of two girls one day to reel a pound of raw silk. It is estimated that the value of the waste, in floss, double cocoons, etc., will about pay for power, foremanship and interest on machinery for reeling. The cost of reeling in France is estimated at $1 per pound.

About eight hundred mulberry trees may be cultivated on one acre of ground. They should be set out in equidistant rows, diamond shape. The trees will grow from four to five feet high the first year from the cuttings. Each tree will produce about twenty leaves for feeding, but no branches. The second year branches will be put out and the foliage largely increased. The trees should be trimmed and trained, as already described under the appropriate head. The third year it may be counted as a tree, and will yield ten or twelve pounds of leaves. It will come into full bearing in four or five years. The trees will produce two crops of leaves each year. In Europe the first is fed to the silkworms and the second furnishes a large supply of food for cattle, for which no green food is better. The quantity obtained is very large. Mulberry leaves would undoubtedly furnish a most excellent material for a silo, by which they might be readily kept and fed at leisure during the fall and winter months.

It may be premature to estimate the profits of silk culture in this State; but the writer, having numerous and correct data to guide him, ventures upon a few figures in that direction, which allow of a most liberal margin for discount—the records of numerous isolated experiments. In making the estimates he has been guided largely by the experience of a young gentleman who has spent some twenty years in practical silk culture in Syria and in France. It requires about twenty pounds of leaves to produce one pound of cocoons. An acre and a quarter of ground ought to sustain trees enough, when full grown—say the fourth year—to produce one thousand pounds of fresh cocoons, or about seventy-five pounds of raw silk. Five acres will feed worms enough to produce four thousand pounds of cocoons, or about three hundred pounds of raw silk. The labor cost of producing this may be estimated substantially as follows: One grown person and two boys or girls, first ten days of feeding; two grown persons and five boys or girls, second ten days; two grown persons and fourteen boys or girls, third ten days; two grown persons and five boys or girls five days to gather and pack the cocoons.

The above foots up seventy days' labor for a man and two hundred and sixty days' labor for a girl or boy. At $1.50 per day for the former and 75 cents for the latter, we have a total cost of $300.00. Add, for pruning and cultivating the trees and the eggs, $200, and we have, as the total cost of producing four thousand pounds of cocoons and getting them ready for the market, $500.00. These cocoons ought to be worth, at a low estimate, 35 cents per pound, or a total of $1,400. If we add one-quarter to the cost and deduct one-quarter from the estimated value of the result, we shall still have a profit of $425 as the return from five acres of land, and the oversight of the business for only five or six weeks of time during the dullest season of the year. How does this compare with the most profitable crops which can be taken from our farms and orchards, which require from four to six months of almost constant care and labor to make and gather?

To realize the above estimates skill and experience are required, as no one can expect to meet with anything but failure if he starts in with a large operation at first. For reasons readily explained, we have had failures in the business heretofore. These failures, however, were not the fault of the business, but of the methods in conducting it, and, in some cases, from accidental circumstances, which a little care and forethought or previous experience might readily have obviated.

We should begin the work in a small way. Set out a few trees this season, say twenty, fifty or one hundred. You will get leaves enough by August or September to feed a few hundred worms. Next season you may feed as many thousand. You will thus be gaining experience while your trees are growing, and your experiment will not cost you anything. If you make a failure you will at least learn something and enjoy a pleasureable experience. Trees or cuttings may be set out anywhere from December to July.

CONCLUSION.

Silk culture is a business which can readily be started, and with but little capital. You can make it build itself up by merely putting in a little work at a time when you have little or nothing to do. The children, either girls or boys, can do it. The labor required will be instructive recreation. It need not interfere materially, even when conducted on quite an extensive scale, with the usual farming operations, as it comes between the seasons of farming proper.

All that is needed to make silk culture a success in California is a little earnest work in disseminating the right kind of information to induce our farmers' wives and children to produce the cocoons. This work the ladies of the California Silk Culture Association are now engaged in. They are endeavoring to encourage the culture of silk—the production of cocoons—among the farmers of the State, until it shall become here, as in Southern Europe, a great and leading industry; an industry especially important in its relation to home employment, to domestic comfort, and remunerative beyond any other which can be engaged in around our firesides. By introducing the process of reeling, families and children may therein find remunerative employment the year round. More than any other it will dignify labor in our homes, and give employment to those of our boys and girls who most need it.

In order to inspire confidence and ensure a market for cocoons a little capital is needed to establish a cocoonery and procure a few reels with which to start a filiature. We have an abundance of skill and experience now in this city to do the work, and we have a good market for the raw silk at our own factories, already in operation in this city, in Sacramento and at San Jose, which now import their silk from Japan at a cost which will well repay its production here.

The silk business is, perhaps, the most profitable of all the industries in France or Italy. The superior facilities of our climate, and the better educated and more apt character of labor here, is more than an offset for the difference in the cost of labor between California and that of other countries.

The governments of France and Italy encourage the industry in various ways. The advantages derived from it are freely dwelt upon in all their journals, and are continually urged by their leading men. The methods and practice of silk culture are taught in all the schools throughout France, from the primary to the grammar grades, in the convents and in all the high schools. All classes have constantly impressed upon them its simplicity, its usefulness and its necessity. It can be carried—the reeling and weaving—into every household, in city or country, where there is time to spin and weave for employment. There is no other industry in the world which can be made so generally universal in a community, or for which there is so little importance, in the matter of economy, that it should be conducted with large concentrated capital or in large establishments. From the feeding of the worms to the weaving of braids, ribbons, dress goods and the knitting of hosiery, it can be conducted quite economically in a family.

GENERAL REMARKS.

We give annexed a representation of the silkworm at its work in its natural condition. The female moth is seen laying her eggs upon a leaf of the mulberry tree. The chrysalis from which she has just emerged

is seen near by. A full-grown worm is also shown, just about ready to commence spinning its cocoon. The manner in which the cocoon is attached to the leaf is also shown. Although the matured fruit appears while this work is going on, it is proper to remark that the worm completes its labors and constructs and enters his silken shroud long before the fruit of the tree is ripe. After the leaves have given off their substance to mature the fruit they would not contain the proper nourishment for the production of a good article of silk.

The late exhibitions of silk culture at Atlanta and Philadelphia seem to have awakened a new interest in the work throughout the Union. The managers and judges of the Silk Department at the Atlanta exposition took especial pains to examine closely into the practice and economy of the business as conducted in this country. Their

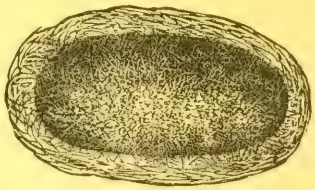
report is highly favorable, both as to its practicability and profit.

The manufacturing portion of the industry is already well established. The great need, now, is that we should produce our own raw silk, for the supply of which many millions of dollars are now annually sent out of the country. The exhibitions referred to have abundantly proved that the production here of the very best silk is possible, and those who have tried it on a practical scale, at the South, have pronounced it profitable. It is a branch of American industry which commends itself to all who desire to see the wealth that grows from it retained in our own country. It moreover commends itself as an industry especially fitted to a large class of American women, who need some employment to keep them from being dependent on others; also to children of both sexes, but especially girls, who have need to do something with which to help themselves pecuniarily during the period of their minority.

The Atlanta Committee, in the course of its report, says: "In no business can women be more profitably and respectably employed than in the production of silk. The draft upon our national resources for imported silk has been one of great magnitude. If patriotism and the love of independence are the offspring of America, let us unite our efforts, and, by the aid of our Legislatures, our Representatives and an intelligent agricultural people, at once encourage, protect and foster the production of American silk."

As an outcome of the Philadelphia exhibition, the manufacturers of textile fabrics in that vicinity have contributed $20,000 for the establishment of sericultural schools, or filatures, by which a ready market can be obtained for cocoons that may be produced in that locality. It is only by such enterprise and by such means that this country can render itself independent of China and Japan, and compete successfully with England, France and Germany in the product of silks.

It is the establishment of schools and filatures and a constant reiteration of the importance of the business that has placed those countries at the head of the silk business, and given them almost exclusive control of one of the most important national industries of the world. Will not some of the wealthy and enterprising capitalists of this State make a small venture in the same direction, to encourage the movement already initiated, to place California in the list of the silk-producing countries?

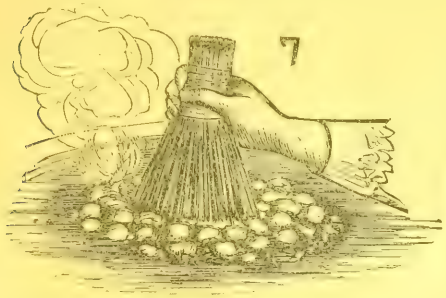


The figure given herewith represents a half section of a cocoon, with the outer floss or loose covering stripped off. The floss thus removed is economized by being carded and woven up like wool or cotton. The same use is also made of what are called "pierced cocoons"—those from which the moths have been allowed to work their way out for purposes of reproduction. It will be seen, by reference to the figure, that the worm does not wind in concentric circles, as a ball is wound, and as might be supposed would be the case; but the silk is laid on irregularly, in a sort of figure 8 loop, placed first in one place and then in another, and so laid that in reeling several yards of silk may be sometimes reeled off without turning round the cocoon.

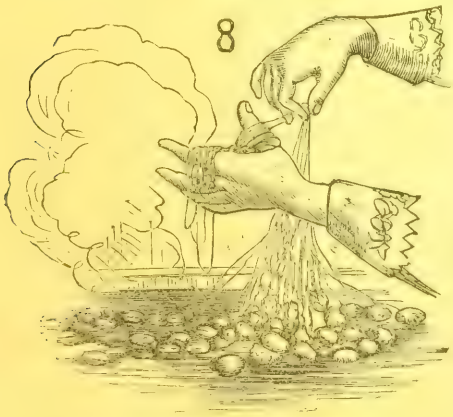
The reeling of silk from the cocoons requires considerable skill and practice, but still the process can easily be learned from a skilled operator. Reeling may be done at any season, and is very pretty work for young ladies to do at home. Great improvements have recently been made in reeling machines, which are very simple in their construction and not costly.

In proceeding to the operation, the cocoons are thrown for a while into a vessel of warm water, where the gum, which always accompanies silk as it is laid on the cocoon, will soften and dissolve. Soft water should

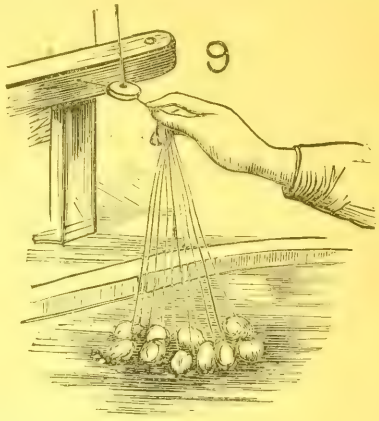
always be used. The temperature must be a matter of experience, and will vary somewhat with the different kinds of cocoons and different qualities of the silk. The water must be kept at an even temperature by being placed over a lamp or small coal-oil stove. A handful of cocoons is thrown into



the water, which must be nearly boiling hot, and pressed down below the surface by the use of a small whisk of broom corn, until the gum has softened a little, so as to loosen the ends of the filaments. The operator then stirs the cocoons about with the whisk until the fibers begin to adhere to it (see Fig. 7). When a sufficient number have



been thus collected they should be taken off and gathered in the hands, as shown in Fig. 8. When a sufficient number have been gathered to form a thread, the ends are brought together and connected with the reel, as in Fig. 9. The number to be thus united varies according to the fineness of the thread desired. The above is not given with the expectation that anyone will be able to reel from the information here given; but only with the view of giving the reader a general idea of the manner and process of reeling. The product of the cocoons, when reeled, is known as "raw silk," and its value



depends very much upon the skill and care with which the reeling is done.

The hatching and feeding season may be prolonged greatly beyond a single feeding season by hatching the worms in succession for several weeks. The second hatching may be made, say four or six days after the first, and so on through a series of six or eight, or more, hatchings. The number of hatchings must be regulated by the character of the feed, for as the leaves become old and tough, they are gradually unfitted for making good silk. Hatching may be kept up as long as new and tender leaves can be procured for feeding the young worms. By this method both space and labor may be greatly economized in the cocoonery. Where successive hatchings are adopted, the cocoons for producing eggs should be selected from either the first or second hatching; and, in any hatching, the cocoons that are produced by the worms that come out first are much preferable to those that appear later.

The mere raising of cocoons is a very simple operation; but, in order to render it profitable, it is necessary that we should find a market, either for the eggs or cocoons, or for both. We have already, on page 4 shown that a market may be had for eggs in

France and Italy; but, as that may be only temporary, it is of great importance that we should create a home market for cocoons. This can be done only by establishing, somewhere in this vicinity, a reeling factory, or filature, as it is generally called.

The operation of reeling requires both skill and capital. The former we have with us, to a limited extent, indeed, but all that is needed to furnish the necessary instruction to any number of needed employees. This skill, and the necessary capital to employ it, can undoubtedly be made available as soon as a supply of cocoons is provided to give employment to reelers. The chief efforts of the California Silk Culture Association are being extended in this direction. The Society, through its officers, has distributed thousands of circulars of information, and eggs, and mulberry cuttings, to those who are willing to undertake the production of cocoons. No attempt has been made to stimulate expensive projects; but our farmers and our farmers' wives and daughters have been urged to start the business in a small way, to gain experience and prove to their own and the satisfaction of others that cocoons and raw silk can be produced at a profit in California.

The business is already being initiated in nearly half the States of the Union, in no one of which are the conditions so favorable as in California.

Herr Liederman, a prominent Mennonite, near Newton, Kansas, according to the Chicago *Inter-Ocean*, last season made a practical experiment of silk culture on his farm. He had surrounded his one thousand acres with a hedge of mulberry trees, which last year began to produce an abundance of leaves. He procured a quantity of eggs and raised about three thousand pounds of cocoons, at a cost, as reported by the *Inter-Ocean*, of only about $300. A great number of Mennonites who have been engaged in the business in Germany have already set out mulberry trees, and, within a year or two, expect to enter very largely into the business of producing silk.

In New Zealand the business has already taken a sure hold as one of the growing industries of that enterprising colony. The business there was first started through the efforts of the ladies, very much in the same manner as the ladies are now moving in this State. The cost of producing raw silk there is set down at an average of about $2.50 per pound.

Mr. L. S. Crosier, manager of a filature recently established at Corinth, Miss., offers from fifty to seventy-five cents per pound for green cocoons, according to quality. The cocoons, however, must be produced from a particular breed of worms, the eggs for which he furnishes, and which he states in his circular will produce a cocoon weighing from six to eight times as much as the ordinary Japanese cocoons.

Mr. Frank Cheeney, one of the four brothers largely engaged in silk manufacture at South Manchester, Conn., who is now on a visit to this State, informs the writer that his company is now paying from sixty cents to one dollar per pound for pierced cocoons. The price varies with the quality. They pay seventy-five cents for Japanese waste and pierced cocoons. They do not buy perfect cocoons, as they have no filature connected with their establishment. The prices they pay for pierced cocoons would be equal to about seventy-five or eighty-five cents for a first-class article of green cocoons.

Prof. C. V. Riley, of the Department of Agriculture at Washington, in his recent silk culture report, refers to a number of parties in various parts of the Union who are raising silk worms very successfully. Mr. E. Fashnach, of Raleigh, N. C., has been thus engaged for several years. He ships his cocoons to Marseilles, France, where he receives an average of $250 per pound, net, for dried cocoons—equal to seventy-five or eighty cents green. Mr. B. A. Webber, of Rockford, Ill., shipped forty pounds of cocoons to Europe last year. But most of our silk growers have prepared to ship eggs, for which France paid to the United States $27,000 in 1876, which amount has been largely increased every year since.

We understand that Prof. Wilkinson, of

the Deaf and Dumb Institute at Berkeley, has signified his willingness to establish a filature at that place as soon as he can be assured of a sufficient supply of cocoons to keep five or six reels at work. It is to be hoped that the press of California will aid the efforts of the California Silk Culture Association in encouraging the establishment of silk industry in this State. As already advised, let it be done in a small, experimental way, until the proper degree of experience has been gained and the profits of the industry fully assured. Small profits are all that should be expected, although there is good reason to believe that when large numbers of our people become thoroughly educated to the work and the business fairly starts on a small scale, larger ventures may be entered upon with good success and profits.

Professor Riley, in a recent communication to the *Scientific American* on "Silk Culture in the United States," writes, in regard to the labor question involved, as follows:

"The greater value of labor here, as compared with labor in the older silk-growing countries, has been in the past a most serious obstacle to sericulture in the United States, but conditions exist to-day that render this obstacle by no means insuperable. In the first place, comparative prices, as so often quoted, are misleading. The girl who makes only twenty or thirty cents a day in France or Italy does as well, because of the relatively lower price of all other commodities there, as she who earns three or four times as much here. Again, the conditions of life are such in those countries that every woman among the agricultural classes, not absolutely necessary in the household, finds a profitable avenue for her labor in field or factory, so that the time given to silk raising must be deducted from other profitable work in which she may be employed. With us, on the contrary, there are thousands—aye, hundreds of thousands of women who, from our very conditions of life, are unable to labor in the field or factory, and have, in short, no means outside of household duties of converting labor into capital. The time that such might give to silk culture would, therefore, be pure gain, and, in this sense, the cheap labor argument loses nearly all its force. This holds more particularly true in the larger portions of the South and West that are least adapted to dairy products, or where bee-keeping and poultry-raising are usually confined to the immediate wants of the household. In the early part of the century the females in most households, even of the well-to-do, found profitable employment in the spinning wheel and the distaff. With modern improved appliances and the general introduction of machinery the average American girl is too often doomed to idleness or else forced to leave her home to add to the family income.'

CORRESPONDENCE.

Any information concerning silk culture may be obtained by addressing Mrs. T. Lucas, President of the Womans' Silk Culture Association of the United States, No. 1028 Race street, Philadelphia, Penn.; Mrs. John B. Felton, President of the California Silk Culture Association, No. 930 Adeline street, Oakland, Cal.; Mrs. T. H. Hittell, No. 808 Turk street, San Francisco, Cal., the Corresponding Secretary of the California Silk Culture Association; or the compiler of these pages, Mr. W. B. Ewer, of the *Pacific Rural Press* San Francisco, Cal.

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